SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CLXX.] MARCH, 1880. [PRICE FOURPENCE. or 5s. per ann. post free.

THE AUSTRALIAN METEOROLOGICAL CONFERENCE,

NOVEMBER 11TH—14TH, 1879.

THIS meeting of the chiefs of most of the Meteorological systems of Australia was convoked (at the suggestion of Mr. H. C. Russell) by the Colonial Secretary of New South Wales, for the purpose of considering the following propositions:—

1. To consider the meteorology of Australia and New Zealand, with a view to united action in its investigation.

2. To consider whether additional first-class stations shall be established, and if so, in what localities.

3. To consider the desirability of using the same class of instruments at all stations and making the observations at the same local hour.

4. To consider the desirability of securing the co-operation of the meteorologists of New Zealand and Tasmania in the system of weather telegrams, which now embraces the Colonies of South Australia, Victoria, New South Wales, and Queensland.

5. To consider by what means the weather telegrams may be transmitted and published for public information at an earlier hour than they are at present.

6. To consider whether meteorological stations should be established upon the highest available mountains for the special study of winds.

The meetings were held at the Observatory, Sydney, N.S.W., and there were present—

James Hector, Esq., M.D., C.M.G., F.R.S., Inspector of Meteorological Stations, New Zealand.
C. Todd, Esq., C.M.G., F.R.A.S., Government Astronomer, South Australia.
R. L. J. Ellery, Esq., F.R.S., Government Astronomer, Victoria; and
H. C. Russell, Esq., B.A., F.R.A.S., Government Astronomer, New South Wales (Chairman).

Mr. Todd has very kindly sent us a copy of the Minutes of Proceedings, and we have much pleasure in laying before our readers an abstract of it, with just a few notes on those points respecting which we do not thoroughly agree with the delegates. The following are the resolutions adopted:—

(1). "That in view of the great importance which a better knowledge of the movement and origin of strong gales and storms on our coast lines and neighbouring seas is to the shipping and commercial interest generally, it is desirable to secure, as far as possible, co-operation in all the Australasian Colonies for the investigation of storms, as well as for agricultural and generally climatological purposes."

(2). "That with the view of giving effect to the foregoing resolution, similar observations and the same form of publication should, as far as possible, be adopted throughout the Colonies."

(2). "That in order effectively to carry out the objects of the Conference as affirmed in the foregoing resolutions, it is desirable to establish first-class meteorological stations in certain well selected positions in the several Australasian Colonies, including New Zealand, in addition to those now existing."

(4). "A first-class station may be defined as one at which the observations taken are limited to those for determining atmospheric pressure; maximum and minimum daily temperature of atmosphere, and of insolation and radiation; the average daily amount of moisture, the rainfall and number of rainy days; the force and direction of wind, and amount and character of cloud."

We regret this decision, as it conflicts with the definition of a first order station adopted at Leipzig, and the same term ought to have the same significance all the world over.

(5). "That the instruments at each first-class station consist of a mercurial barometer of either the standard or Board of Trade form; thermometers of Kew or approved patterns, compared with standards as frequently as possible; rain-gauges of 8 inches collecting diameter; and wind-gauges of any approved form. The local hours of observation to be 9 a.m., 3 p.m., and 9 p.m. Beaufort's scale of wind to be adopted; the observations to be recorded in equivalents in velocity and pressure."

(6). "That it is very desirable to obtain the co-operation of the Government of Tasmania, and to persuade them to establish a station at the public expense at Hobart Town."

(7). "That it is desirable to secure the co-operation of the Governments of Western Australia, New Zealand, and Tasmania, in the system of weather telegrams, which now embraces the Colonies of South Australia, Victoria, New South Wales, and Queensland."

(8). "That in the opinion of this Conference, it is desirable that weather telegrams and forecasts shall in all cases depend upon the observations used for general meteorological and climatological statistics, and be under the direction of the head of the meteorological department in each Colony."

(9). "That this Conference, having been informed that the Eastern Extension Telegraph Company will charge half rates for the transmission of weather reports through the cable connecting Australia and Tasmania, and probably also the cable to New Zealand, recommend that the cost of such reports be defrayed by the participating Colonies in equal proportions; and that, in the opinion of this Conference, such cost need not exceed in the aggregate £350 per annum."

"That in the opinion of the Conference, this expenditure is justified by the extreme importance to the shipping interest of early information of the approach of dangerous easterly and westerly gales."

(10). "That the several Governments be requested to cause precedence to be given to the regular weather telegrams and special storm reports."

(11). "That, in the opinion of this Conference, there should be established in each of the Colonies, upon a high mountain peak, a meteorological observatory

for the special study of winds and other meteorological phenomena, and that the most desirable positions for them would be the following :—

	About
South Australia—Mount Lofty	2,500 feet above sea level.
New South Wales—Kiandra	4,600 ,,
New Zealand—Tauhara Taupo	4,600 ,,
Do. Mount Herbert	4,000 ,,
Tasmania—Mount Wellington	4,000 ,,
Victoria—Mount Macedon	3,500 ,,

In the discussion upon this resolution the following remarks were made by Mr. Russell :—

The Chairman said, his object in putting this proposition before the Conference was to obtain, if possible, records of the winds that pass over-head, and were therefore lost to the records of the lower stations.

From observations made years ago by Strzelecki, it appeared that at the top of Mount Wellington, he had noticed a hot wind which was not felt at all 3,000 feet lower on the same mountain; and from similar observations in this Colony, it appeared that hot winds were frequently felt at the high stations and not at those which are at a lower level.

Similar facts might be stated with regard to the south-east gales, which frequently appeared first at lofty stations. He thought these facts were a sufficient reason for the establishment of stations on high mountain peaks,—the only means which appeared to him available to secure the desired information.

We are by no means desirous of thwarting a project which, from Mr. Russell's statement, may evidently be of great utility. But we should have thought it wiser to leave such costly undertakings as mountain stations for the consideration of a subsequent Conference. We have some fears that the erection of these mountain stations is sometimes due to a mixture of science and sensationalism.

(12). "That the revision of the present telegraph weather code be referred to Messrs. Russell and Ellery, with a view to its simplification and extension."

(13). "That the interchange of weather statistics, in carrying out the suggestions of this Conference, between the different Australasian stations, should be in the form of a diagram; and that this should not interfere with the printing of statistics by the different Colonies in any way they like."

(14). "That the monthly graphic records for interchange consist of curves, showing—Barometer, Velocity and direction of wind, Temperature, Humidity, Rainfall, with remarks upon weather, especially with reference to storms and atmospheric disturbances and that specific forms be prepared and distributed to the co-operating Colonies.

"That the mean humidity curve be derived from the means of maximum and minimum of wet and dry bulb thermometers.

"The barometer curve to be constructed from barographic records, so as to depict the turning points.

"The temperature curve to represent maximum and minimum and mean for each day.

"The velocity and direction of the wind to be deduced from the anemometer."

In this country maximum and minimum wet bulb thermometers are scarcely ever used, because the max. of the dry bulb and of the wet bulb not being necessarily synchronous, the difference between them is not always, if indeed often, a true indication of the actual difference between the dry and wet at any given instant; and the

same argument applies to the minimum. In the absence of self-recording dry and wet thermometers we should have preferred to take the mean of the humidity at 3 a.m., 9 a.m., 3 p.m., 9 p.m., obtaining the former from one of Negretti's turn-over hygrometers.

(15). "That, in the transmission of cablegrams, the reports be generalized from the local weather reports."

(16). "That the cablegrams furnished to Melbourne by Tasmania should conform with those between the Australian Colonies."

(17). "That weather telegrams from the Australian Colonies shall comprise—(1) Barometer reduced to 32° and sea level, (2) Dry bulb, (3) Humidity, (4) Maximum and minimum, (5) Direction and velocity of wind, (6) State of weather, (7) Rainfall, (8) Sea disturbances, with a synoptical report of the weather generally."

"And that within New Zealand the same system should be adopted."

(18). "That the extreme importance of the weather system proposed be strongly urged upon the Queensland Government, with a view to obtain their more active co-operation."

(19). "That Australia be divided into six meteorological areas for transmission of reports to New Zealand, viz., Western Australia, South Australia, Victoria, New South Wales and Queensland; South Australia being divided into two districts, tropical and extra-tropical."

(20). "That weather telegrams be written on paper of a special colour, so as to be readily distinguishable in the offices."

(21). "That the solar radiation thermometers should be blackened bulb thermometers *in vacuo*, and should be exposed on an open space at an elevation of 4 feet 6 inches from the surface of the ground, supported by a post carrying two light arms."

(22). "That the following subjects for experiment be referred to each member of the Conference, for future consideration and report:—

1. Shade temperature.
2. Swinging thermometer and thermometer sheds in use.
3. Standards to be swung with 2 ft. 6 in. string during sunshine and after sunset.
4. Observations to determine the difference in humidity by self-registering maximum and minimum thermometers, and by other methods.
5. The best method of measuring the velocity and pressure of wind.
6. Whether any better method than black bulb thermometers can be devised for measuring the direct effect of the sun.
7. As to the best method of determining spontaneous evaporation."

This was setting themselves some work with a vengeance; we think that it would have been far better to have divided the subjects among the delegates, instead of each of them being directed to consider and report upon them all. Several of the points have up to the present time proved beyond the solution of all the European Meteorologists. Who, for instance, can answer questions 5, 6 and 7? However, some of the Australian delegates are men of tremendous energy, and one (if not more than one) is the inventor of several very ingenious pieces of apparatus; we therefore sincerely hope that they will obey their own instructions, and after consideration, report, and finally that their reports will be collected and printed.

(23). "That as investigation of the Newcastle tide-gauges has shown that such instruments give valuable indications of distant earthquakes, gales, and

sea disturbances, it is desirable, in the opinion of the Conference, that self-registering tide-gauges be established in as many convenient places as possible on the coast, in connection with the Meteorological Departments of the different Colonies."

(24). "That the foregoing minutes be adopted as the Report of this Conference on the various matters referred to it, and that the Chairman be requested to report to the Government of New South Wales."

Thus ends the record of a meeting which, in its inception, in its programme, in the high standing of the men who attended it, and in the wisdom of nearly all its resolutions, reflects credit on the Colonies concerned. The adoption of its proposals rests with what may be called the political authorities; we hope that they will support them, for we believe that in so doing they will benefit commerce and agriculture, as well as science.

REGISTER OF TEMPERATURE AT NANCY & STRASBURG.

(continued from page 10)

To the end of the Frost of 1879-80.

DATE.	NANCY (town).		Meteorological Station of Belle Fontaine.	At Enzheim, Rhine Valley, nr. Strasburg.	REMARKS.
	Min.	Max.	Min.	8 a.m.	
Feb. 1...	+13	+31	+ 8	+ 8	Fine clear days.
,, 2...	+14	+35	+13	+11	
,, 3...	+20	+30	+15	+12	Dense fog and hoar frost, both at Nancy and in Rhine Valley.
,, 4...	+11	+33	+ 8	+12	
,, 5...	+12	+35	+ 4	+11	
,, 6...	+17	+38	+11	+ 9	
,, 7...	+17	+38	+ 9	+12	
,, 8...	+30	+43	+26	+14	Showery, cold, and cloudy.
,, 9...	+35	+45	+32	+29	
,, 10...	+33	+44	+28	+30	
,, 11...	+38	+47	+40	+34	
,, 12...	+38	+42	+36	+37	
,, 13...	+37	+45	+36	+34	Cold, with fog both at Nancy and in Rhine Valley. Fine as sun got power.
,, 14...	+32	+45	+26	+32	
,, 15...	+33	+47	+26	+30	
,, 16...	+34	+50	+27	+27	
,, 17...	+46	+57	+46	+41	Frost finally disappeared.

I have thought that it would be interesting to have the complete record of the severest frost of this century in the east of France and the Rhine valley, and therefore send the register of the temperature in continuation till 17th February, when the frost finally broke up. The remarkable part of it was the very gradual disappearance of the frost between the 8th and 17th, with mild showery weather, and no determined thaw. This was of the greatest benefit to the country, and prevented many disasters from the too sudden breaking up of the banks of ice, which had formed in all the rivers.

GEO. F. PEARSON, COLONEL.

REVIEWS.

Report of the Meteorological Service of the Dominion of Canada for the Year ended 31st December, 1877. Ottawa: Maclean & Co.

IN many respects this report is the best which we have received from Professor Kingston, many important elements being given in all necessary detail. We wish, however, that this report gave fuller particulars respecting the instruments employed and their mounting. Recollecting as we do the generally excellent character of the instructions to observers prepared by Prof. Kingston, we do not believe that there is much to fear respecting the organization of his stations, but the table on pages 209—212 affords ample room for two or three extra columns, which might be devoted to diameter of rain gauge, height of mouth of rain gauge, and height of thermometer bulbs above soil. We are glad to see that an accurate map of the Dominion accompanies the report; it would be improved in appearance, and in clearness, by the whole of the lakes and seas being shaded, so as to mark out prominently the distribution of land and water.

Perhaps the most remarkable feature of Canadian meteorology is the great range of temperature. Table VI. of the above report gives the highest and lowest temperature at each of about seventy stations, and we have worked out the following results from that table:—

Maximum Temperatures.—At four stations the highest temperature in the year did not reach 80°; these were all coastal stations, two in Newfoundland, one in New Brunswick, and one (Esquimault) to the south of Vancouver's Island, British Columbia. At sixty-six stations the max. was 80° or above, at thirty-seven it was 90° or above, at seven it was above 95°, and at two it exceeded 100°, being 105° at Spence's Bridge, British Columbia, on July 20th, and 109° at Fort Macleod, North-west Territory, on July 21st. These two stations are nearly in the same latitude (50°) and are about 500 miles apart, the former being on the east and the latter on the west of the Rocky Mountains.

The more remarkable feature of Canadian climate is the severely low temperatures which are usual. The *minimum temperature* is reported from 71 stations; of these there are only three at which the temperature did not fall to or below zero. The warmest of these three is the station already mentioned as having one of the lowest maxima, viz., Esquimault, where the max. for the year was 76°·9, and the min. 25°, or an entire range of 51°·9. At the majority of stations the min. were below —10°; at thirty-four stations they were below —20°, at eleven stations below —30°, and at five stations below — 40°. We give the details of these extremely low values:—

	Lat.	Lon.	Minimum Temp.	Date.
Fort Garry, Manitoba	49° 53′ N	97° 7′ W	—44°·3	Jan. 14.
York Factory, N.W. Territory	57° 0′ N	92° 26′ W	—45°·0	,, 11.
Winnipeg, Manitoba.....	49° 55′ N	97° 7′ W	—47°·6	,, 15.
Battleford, N.W. Territory...	52° 41′ N	108° 30′ W	—51°·0	,, 11.
Kalmar, Keewatin, ,, ...	49° 45′ N	94° 58′ W	—63°·0	,, 14.

It seems to us rather a pity that the observations during this cold spell are not fully worked out. The only further facts which we can find in other parts of the volume, respecting the temperatures at Battleford and Kalmar, are the following:—At Battleford the min. on the 11th was —51°, the max. on that day was zero, and the mean of readings at 8 a.m., 2 p.m., and 8 p.m. was —31°.

At Kalmar the mean of observations at 7 a.m., 2 p.m., and 9 p.m. (giving double weight to the 9 p.m. observations) was on the 14th —38°·8, and on the 15th —32°·6. There can, therefore, be no doubt as to the truthfulness of these excessively low temperatures, *ninety-five Fahrenheit degrees* below freezing point, —63° Fahrenheit, or —52°·8 Centigrade.

Ciel et Terre: Revue Populaire d'Astronomie et de Météorologie. Bruxelles: F. Hayez. 8vo.

WE have great pleasure in calling the attention of our readers to this new magazine, for every step which tends to increase the number of persons familiar with meteorological facts, tends necessarily towards the supply of that which we have always held to be the greatest want in the meteorological world—viz., "neither more observations nor more money (though neither of these is to be despised), but more brains, more hard workers, more deep thinkers." The magazine is written in an extremely lucid style, and the first number—that for March 1st, 1880—exactly accords with the following paragraph in the Prospectus:—

"The Review of Astronomy and Meteorology is intended to exhibit in language comprehensible by all, both the facts and general theories upon which the sciences are based, as well as the new discoveries with which ceaseless labours are ever enriching them. While by its exposition of fundamental facts and generalisations it will maintain a popular character; it will be, by its bibliographies, and by the scientific notes which it will contain, a sure and faithful guide for those who are attentively following the progress of science or are themselves co-operating in its advancement."

We quote one more paragraph:—

"If, by its popular character, the Review is accessible to the general public, it is equally so by its exceptionally moderate price. We believe that these considerations are such as to ensure the success of our enterprise and to obtain for it the sympathies of all who, both in Belgium and abroad, appreciate fully the importance of the diffusion of scientific knowledge."

The promoters may well say that the price is "exceptionally moderate." Each number is to contain 24 pages; there are to be two numbers each month, *i.e.*, 24 numbers per annum, and therefore nearly 600 pages; and this is to be sent post free for eight shillings to anyone who will send a post office order for that amount to

M. C. Hooreman, rue du Cadran, 10, à St. Josse-ten-Noode, Belgium. Either Belgian printers work for half the price of English ones, or else we fear that the proprietors will have some difficulty in making both ends meet. That, however, is their business; ours merely is to tell our readers that we believe that they will get ample return for their money.

In concluding, we give the list of Editors and the Contents of the first number. We do not translate or reproduce any of the articles, because we advise those of our readers who are familiar with, or desire to refresh their, French, to get the original.

EDITORS.

Astronomical.	*Meteorological.*
Estourgies, L.	Hooreman, C.
Fievez, C.	Lancaster, A.
Lagrange, C.	Van Rysselberghe, F.
Niesten, L.	Vincent, J.

CONTENTS.

J. C. Houzeau, La conquête de l'heure.—A. Lancaster, Les grands froids de Décembre, 1879.—C. Fievez, L'analyse spectrale.—L. Niesten, Le ciel pendant le mois de mars.—J. Vincent, Revuè météorologique de la quinzaine.—Notes.—A. Lancaster, Bibliographie.

Annual Report of the Chief Signal Officer to the Secretary of War for the year 1878.—Washington : Government Printing Office. 8vo.

THIS is, we think, the largest volume which we have ever seen without either an index or a table of contents. It contains several excellent notes, papers and suggestions, but it ought to have some list of its contents. What would the "Index Society" say to a book of nearly 700 pages, with probably more than a hundred maps and engravings, and absolutely nothing to tell one in what part of the volume to look for any single subject.

The Signal Office is really a wonderful establishment, and while we should prefer to see in several respects more science and less show, we heartily recognise the vigorous not to say overwhelming energy and comprehensiveness which characterise the office. With an enormous staff (we saw the numbers a few minutes since, but for want of an index we cannot now find them,) and a very large supply of money, the department seems to undertake nearly everything—from shooting Indians to saving shipwrecked mariners—it issues weather warnings, and farmers' bulletins, looks after injurious insects, records the freezing of rivers, the level of the water when they are free from ice, gives notice of the advance of floods, reports upon sun spots, prairie fires, shipping disasters, the swarming of bees, &c., &c.

We regret to see that at very many, if not at the majority of

stations, the instruments are exposed at windows at considerable heights above the ground, and we infer that many of the rain gauges are upon roofs. A single table giving tabular details on these points would be satisfactory, especially if it showed that our impression upon this point is erroneous.

Very full and illustrated descriptions are given of tornadoes in February and August, 1878. Sergeant Reed concludes his report upon one of these with the following words:—

"Thirty persons lost their lives, and seventy others [were] more or less injured, Fifty-five houses and barns were completely and [? or] partly demolished; careful estimates of loss of property destroyed by the tornado $250,000 [£52,000.]

THE FROST OF DECEMBER, 1879, OVER THE BRITISH ISLES.

(Read at the Meteorological Society's Meeting on February 18th, by W. MARRIOTT, F.M.S.*)*

EXCEPTIONALLY low temperatures were registered all over the British Isles from the 1st to the 7th of December. On the 1st the lowest temperature was —2° at Ketton, near Stamford, and the next lowest was 5° at Trent College. The temperature continued low throughout the day, at several places not rising above the freezing point. On the 2nd the cold was more intense. In the counties of Leicester, Lincoln, and Nottingham the temperature fell below zero, the lowest being —4°·5 at Coston, near Melton Mowbray. Temperatures between 0° and 10° were registered in the north and south of Scotland, and along the central part of the north of England to the midland and eastern counties; while over the whole of England, Scotland, and Ireland, with the exception of the sea-coast stations, the temperature fell below 20°. On the 3rd the temperature was more evenly distributed and not quite so intense as on the previous day; however, in the North Riding of Yorkshire and the valley of the Tees readings at and below zero were registered, the lowest being —2° at Gainford. On the 4th intensely cold weather was experienced over the south of Scotland and the north of England. The lowest reading obtained was —23° at Blackadder in Berwickshire; —16° was also registered at Springwood Park, near Kelso; and readings of —5° were reported at Haddington, Melrose, and Corbridge-on-Tyne, and —4° at Alston. Temperatures below 10° were registered over the south and south-east of Scotland, and over the north of England as far as the valley of the Trent, and also in the eastern counties; while over almost the whole of England, Scotland, and Ireland the temperature fell below 20°. In some parts of the south of Scotland and the border counties the maximum temperature during the day did not rise to 20°. On the 5th the minimum temperature was not so low as on the previous day, there being a cloudy sky and a general fall of snow; in Ireland, however, this was the coldest day of the month. On the 6th the temperature fell considerably in Derbyshire,

Nottinghamshire, and Yorkshire; readings of —3° being recorded at Trent —1° at Buxton, and 0° at York and Stanley. At many places the maximum temperature during the day was much below the freezing point. On the 7th very low temperatures were registered over the whole of the north and east of England; the lowest reported was —10° at Ketton near Stamford. The temperature fell below zero in the counties of Essex, Leicester, Derby, Lincoln, Nottingham and York, and also in the south of Scotland, while over almost the whole of the N.E. and central part of England as well as a portion of the S.E. district the temperature fell to 10° or below. Readings below 20° prevailed over nearly the whole of England and Scotland and the centre of Ireland. The maximum temperature during the day at a few places was extremely low, the thermometer at Appleby only recording 12°·4, and that at York 18°. During the next few days a little warmer weather prevailed, but on the 11th the temperature fell below 20° over the central part of England, Scotland, and Ireland. Low temperatures were also experienced at most places on the 12th. Milder weather continued for the next few days, but on the 17th the temperature again fell below 20° over the whole of the south of England. Low temperatures also prevailed on the 18th, 21st, 23rd, 24th, and 26th, while the maximum temperatures at many places on the 21st and 26th did not reach 32°. At almost all the inland stations frost occurred on an average of about twenty-five days during the month, and temperatures below 20° were registered from eight to thirteen days at several places. The only station where frost was not felt was Scilly, the lowest temperature recorded there being 33° on the 2nd.

The only comparatively mild districts were the west and south of Ireland and the extreme south-west of England. Even the seaside health resorts, which are reputed for their mild climates, were not exempt from the cold, the temperature falling below the freezing point on eleven occasions at Ventnor, fifteen at Torquay, twenty at Sidmouth and Eastbourne, and twenty-four at Ramsgate and Worthing.

During the time of the cold weather the barometer was very high over these islands, and an anticyclone was formed over those districts where the lowest temperatures were recorded. That the cold was the result chiefly of radiation is shown by the great difference in temperature at the hill and valley stations. For instance, at Farley, 640 feet above sea level, 17°·7 was registered on the 7th, while at Oakamoor, 300 feet lower in the Valley of the Churnet and less than a mile distant from Farley, the temperature fell to 1°·1.

The effect of the cold upon the health of the community was very great. In London the number of deaths referred to diseases of the respiratory organs increased to 799 in the week ending December 20th, and exceeded the week's average by 288. The public journals record the fact that several persons were frozen to death in various parts of the country. The frost also caused great injury to plants, shrubs, and birds.

SUPPLEMENTARY TABLE OF RAINFALL IN FEB., 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	3·35	XI.	Corwen, Rhug	4·20
,,	Margate, Acol	1·73	,,	Port Madoc	2·90
,,	Littlehampton	3·31	,,	Douglas.....	3·67
,,	St. Leonards	2·90	XII.	Carsphairn	7·67
,,	Hailsham	3·28	,,	Melrose, Abbey Gate...	3·52
,,	I. of W., St. Lawrence.	2·93	XIV.	Glasgow, Queen's Park.	...
,,	Strathfield Turgiss	3·51	XV.	Islay, Gruinart School..	3·46
III.	Great Missenden	3·56	XVI.	Cupar, Kembach.....	2·63
,,	Winslow, Addington ...	2·81	,,	Aberfeldy H.R.S.	6·27
,,	Oxford, Magdalen Col...	2·22	XVII.	Tomintoul.....	2·42
,,	Northampton	2·72	,,	Keith H.R.S.	2·44
,,	Cambridge, Merton Vil.	1·63	,,	Forres H.R.S.	·98
IV.	Harlow, Sheering	2·00	XVIII.	Strome Ferry H.R.S....	8·31
,,	Diss	1·73	,,	Auchnasheen H.R.S. ...	...
,,	Swaffham	1·82	,,	Lochbroom	5·05
,,	Hindringham	1·67	,,	Tain, Springfield.....	·84
V.	Salisbury, Alderbury...	4·15	,,	Loch Shiel, Glenfinnan.	14·58
,,	Calne, Compton Bassett	3·72	,,	Dalwhinnie H.R.S.....	...
,,	Beaminster Vicarage ...	5·06	XIX.	Lairg H.R.S.	3·29
,,	Dartmoor, Princetown..	11·61	,,	Altnabreac H.R.S.	3·85
,,	Langtree Wick	4·39	,,	Watten H.R.S.	2·18
,,	Lynmouth, Glenthorne.	6·69	XX.	Fermoy, Glenville	5·84
,,	St. Austell, Cosgarne...	3·98	,,	Tralee, Castlemorris ...	...
,,	Taunton	4·55	,,	Cahir, Tubrid	5·06
VI.	Bristol, Ashleydown ...	4·50	,,	Tipperary, Henry St....	4·11
,,	Ross	4·88	,,	Newcastle West	3·65
,,	Wem, Sansaw Hall.....	2·29	,,	Kilrush	4·18
,,	Cheadle, The Heath Ho.	2·76	,,	Corofin	..
,,	Bickenhill Vicarage ...	3·36	XXI.	Kilkenny, Butler House	...
VII.	Melton Mowbray	1·81	,,	Carlow, Browne's Hill..	4·07
,,	Horncastle, Bucknall...	1·95	,,	Kilsallaghan.....	2·47
VIII.	Walton-on-the-Hill.....	1·34	,,	Navan, Balrath	2·07
,,	Broughton-in-Furness ..	5·17	,,	Athlone, Twyford	3·20
IX.	Wakefield, Stanley Vic.	1·52	,,	Mullingar, Belvedere ...	2·77
,,	Ripon, Mickley	3·04	XXII.	Ballinasloe	2·94
,,	Scarborough.....	1·62	,,	Clifden, Kylemore	8·98
X.	Mickleton.....	...	,,	Crossmolina, Enniscoe..	5·69
,,	Haltwhistle, Unthank..	2·27	,,	Carrick-on-Shannon ...	3·76
,,	Shap, Copy Hill	8·13	XXIII.	Dowra	2·82
XI.	Llanfrechfa Grange	4·07	,,	Rockcorry.....	2·78
,,	Llandovery	4·99	,,	Warrenpoint	2·78
,,	Solva.....	3·28	,,	Newtownards	2·24
,,	Castle Malgwyn	4·52	,,	Carnlough.....	3·54
,,	Rhayader, Nantgwillt..	8·24	,,	Bushmills	2·08
,,	Carno, Tybritle	4·27	,,	Buncrana	2·24

THE WEATHER IN FEBRUARY.

At the beginning of the month a decrease in atmospheric pressure was in progress in the S. and in the countries to the eastward of the North Sea, while elsewhere the bar. was rising slightly. Pressure, as at the close of January, was highest over E. France and lowest (29·2) in the N. of Sweden; depressions passing northward near our western coasts. On the following day (2nd) owing to a brisk rise of the bar. in Sweden, gradients became less steep, and wind was very generally from S.W. to S.E. over Europe.

A brisk fall of temp. occurred on the 1st over the greater part of England, and a sharp frost was reported from the S. The maximum was, however, as high as 50° in many places. Changes in temp. on the 2nd, slight and irregular.

The general conditions of the next seven days (2nd–9th) were in an unsettled, changeable state. For the first three days it was dull and rather rainy in Ireland, fair over Scotland and the greater part of England, and dry but very foggy in S.E. England. By the evening of the 6th, the unsettled weather in the W. had extended to all parts of these Islands, and, with brief intermissions, of clear weather, continued to the end of the week.

Temp. during the same period was about the mean for time of year in E. and S. England, but slightly above the average elsewhere. Sharp frosts occurred at most places in E. and S.E. England until the 6th or 7th. The greatest excess above the average was at Kelstern, Lincolnshire (6°·0), and the greatest deficit (1°·5) at York and Dover. Wind for the most part S.W.; rainfall rather above mean, except in the N. of Ireland and Central England.

The weather of the following week partook of the same character as its predecessor. Depressions were shewn off our N.W. coast and over France on the 11th, with a rapid fall of the bar. in the W. The depression over France had disappeared by the next day, but others continued to advance, in rapid succession, to our S.W. and W. coasts. A general and rapid decrease of pressure occurred on 16th, the change being more than half-an-inch in all parts of these Islands except N.E. Scotland, and amounting to an inch in the S.W. The depression had its centre (28·6) near Scilly in the morning, and passed slowlynorthwards during the day, while pressure recovered in the S.W.

Temp. was rather above average in N.E. and S. England, below it in Ireland, and about the mean in all other districts. Several slight frosts were experienced during the night-time in central, N. and E. districts. Wind S.E. to S.W. nearly everywhere. Rainfall less than mean in N.W. England and over Scotland, but more elsewhere. At Hurst Castle the total for the week was as much as 1·93 inch, at Strathfield Turgiss, 1·66 Jersey 1·31, while, at Lowestoft it was 0·58 inch, at Durham 0·48, at Manchester 0·30 in.

Very similar were the conditions of the remainder of February. On the 17th the depression above-named, as having its centre over the Scilly Islands on the 16th, was shewn over our western coast, moving *very* slowly northwards; by the 21st the centre was between the Shetlands and the W. coast of Norway, at which stage of its progress it altered its course, taking a S. direction. On the 22nd a large area of low pressure was over England and the North Sea, travelling deliberately in a southerly direction. This area had shifted till it was over France on the 23rd, the bar. having risen everywhere.

On the 24th, the weather over these Islands and their neighbourhood was very settled. A depression, which, on the morning of the 23rd was off our S.E. coasts, apparently united with that which had been travelling southward till it reached the Mediterranean near Toulon, so that an extensive area of low pressure was shown over S.E. France and N. Italy, while pressure was recovering over these Islands and France. Over these Islands the bar. readings were moderately high and extremely uniform. A considerable change in the general distribution of pressure occurred next day. A large and deep depression advanced to the N. of Scandinavia, the mercury fell more than half an inch in that region, the decrease extending quickly to the whole of Sweden, Norway, Denmark, and the northern parts of the United Kingdom. In the S. part of these Islands, however, and over France, the bar. rose, and an

elongated area of high pressure lay over Ireland, England, N. France, and the Netherlands, while a second area of *low* pressure was over the Gulf of Lyons. Consequently W. to S.W. winds were reported from the more Northerly part of W. Europe, light airs in S. England, and N.E. winds in the more Southerly part of W. Europe.

During the night 25th–26th an important subsidiary depression appears to have passed from N.W. to S.E. in the neighbourhood of our northern coasts, and by the morning of the 26th was, apparently, over S. Scandinavia. As a consequence, the bar. fell over the whole of W. Europe, the fall varying from a few hundredths in the W. of France to about 0·7 inch in E. England. During the night 27th–28th a fresh disturbance passed from W.N.W. to E.S.E. across N. Scotland, occasioning a brisk fall of the bar. over these Islands, and a somewhat less brisk fall elsewhere. In addition to this main disturbances, small subsidiaries were shown on our W. coasts. From these disturbances, pressure, however, soon recovered and the bar. rose quickly in N. Scotland and slightly in W. Ireland. The wind, though it remained W. on our S. coasts, over France, and to the eastward of the North Sea, veered to N.W. in Scotland, and to W.N.W. in Ireland. Temp. rose everywhere, and varied from 49° in the S.W. to 37° in the Shetlands.

Temp. during the week (17th–23rd) was 4° above the average for time of year in the E. and N., and 3° nearly everywhere else. Rainfall was in excess of mean, except in N. Ireland. During the last few days of the month rainfall was very slight.

Lowestoft. H. E. M.

A VARIETY OF HOAR FROST.

To the Editor of the Meteorological Magazine.

SIR,—A rather remarkable variety of hoar frost was observed here on the last two days of January and the 1st of the present month. It differed from the more common kind in the conditions under which it occurred. Generally, no doubt, hoar frost is due to the cooling of the ground below the temperature of the air by radiation. In this case the relatively low temperature of the ground was evidently occasioned by the slowness with which the earth, cooled by a long frost, became affected by the thaw then prevailing.

This hoar frost differed also from others in the situations in which it was found, being scarcely less abundant on the roadways, pavements and gravel walks than on the grass. The roads were so white as to give the impression of a thin covering of snow. It was also deposited thickly on the perpendicular faces of walls. Another point noticed was its persistence during the day, notwithstanding maximum temperatures of 43° and 48°. All these peculiarities seem referable to the circumstances mentioned above.

But the most interesting feature was the form of the crystals. On the grass these had the form of scale-like or leaf-like expansions, which seemed to grow day by day until they acquired a diameter of one-third of an inch. *Inter se*, these scales were more or less imbricated, and in some cases, being arranged closely around a short central axis, they approached, in the aggregate, the form of a "double" flower.

GEORGE F. BURDER, M.D.

Clifton, 11th Feb., 1880.

FEBRUARY, 1880.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	Camden Square	2·33	+ 1·11	·44	16	19	53·7	16*	27·0	2	8	17
II.		Maidstone (Hunton Court)	2·21	+ ·99	·50	7	17	...	...	...	...	...	...
,,		Selborne (The Wakes)	3·93	+ 2·22	·66	15	21	55·0	28	27·5	1	6	11
III.		Hitchen	2·08	+ ·82	·55	16	18	52·0	20	28·0	4§	12	...
,,		Banbury	3·60	+ 2·17	1·07	18	23	53·0	19	25·0	1	15	...
IV.		Bury St. Edmunds (Culford)	1·66	+ ·24	·33	16	16	56·0	29	26·0	1‖	12	13
,,		Norwich (Cossey)	1·73	+ ·13	·33	16	15	58·0	19	23·5	1	14	14
V.		Bridport	4·18	+ 2·12	·81	16	21	...	...	...	...	...	...
,,		Barnstaple	4·34	+ 2·26	·98	18	24	57·0	20	29·0	25	...	...
,,		Bodmin	5·62	+ 2·83	1·26	15	22	55·0	19	32·0	24	1	9
VI.		Cirencester	3·89	+ 2·28	·94	18	18	...	...	...	...	...	...
,,		Shifnal (Haughton Hall)	2·12	+ 1·23	·55	16	22	53·0	19	26·0	25	10	16
,,		Tenbury (Orleton)	4·05	+ 2·48	·71	16	22	55·5	4	26·7	25	11	12
VII.		Leicester (Town Museum)	2·35	...	·88	16	18	56·8	18	25·9	1	4	18
,,		Boston	1·94	+ ·73	·61	16	18	55·0	19	26·0	1	11	...
,,		Grimsby (Killingholme)	1·71	...	·47	16	16	54·0	29	32·0	27	0	...
,,		Mansfield	2·21	...	·70	16	18	52·5	29	29·9	8	10	13
VIII.		Manchester (Ardwick)	2·29	+ ·45	·37	28	18	52·0	1†	31·0	1,6	4	...
IX.		York	1·76	+ ·38	·57	16	13	56·5	19	27·0	6	10	14
,,		Skipton (Arncliffe)	6·33	+ 2·66	·91	19	25	50·0	1	25·0	5	7	...
X.		North Shields	1·49	— ·04	·32	16	15	52·3	19	29·0	9	4	5
,,		Borrowdale (Seathwaite)	17·07	+ 5·69	1·78	19	27	...	...	...	...	...	...
XI.	WALES.	Cardiff	3·88	...	1·06	18	22	54·8	19	27·8	1	3	...
,,		Haverfordwest	4·20	+ 1·34	·90	15	21	53·5	19	25·0	23	5	14
,,		Aberdovey	1·91	...	·21	5,15	20	...	...	...	...	...	...
,,		Llandudno	1·75	+ ·40	·23	17	19	55·2	2	32·0	6	1	...
XII.	SCOTLAND.	Cargen	5·19	+ 2·60	·64	17	22	51·4	28	30·8	11	2	...
,,		Hawick (Silverbut Hall)	3·28	...	·64	7	21	...	...	...	...	...	...
XIV.		Douglas Castle (Newmains)	5·55	...	·78	28	22	...	...	...	...	...	...
XVI.		Loch Long (Arddaroch)	11·17	...	1·32	29	21	45·0	5	27·0	9	10	...
,,		Kilmory	5·99	...	·76	6	24	...	...	29·0	23	7	...
,,		Mull (Quinish)	6·70	...	1·13	6	23	...	...	...	...	...	...
,,		Loch Leven	2·50	+ ·20	·60	6	13	...	...	...	...	...	...
XVII.		Arbroath	2·25	+ ·40	·55	7	15	54·0	29	29·0	9	4	...
,,		Braemar	4·71	+ 2·73	1·00	6	21	49·8	29	18·8	9	8	20
XVIII		Aberdeen (Rose Street)	...	...	...	...	...	...	...	...	...	...	...
,,		Portree	10·17	— ·06	1·29	4	27	...	...	...	...	...	...
,,		Inverness (Culloden)	1·58	— ·30	...	...	...	53·0	4	26·0	9	3	16
XIX.		Dunrobin	1·33	— 1·19	·26	27	16	55·5	3	28·5	9	6	...
,,		Sandwick	3·91	+ 1·43	·44	29	25	51·9	4	32·0	9	1	7
XX.	IRELAND.	Cork	...	...	...	...	...	...	...	...	...	...	...
,,		Darrynane Abbey	...	...	...	...	...	...	...	...	...	...	...
,,		Waterford	3·68	+ 1·65	·56	16	22	53·0	20‡	29·0	11	5	...
,,		Killaloe	3·71	+ ·81	·46	19	25	56·0	20	24·0	11	10	...
XXI.		Portarlington	2·04	+ ·01	·31	15	24	55·0	4	30·0	10	3	...
,,		Monkstown	2·66	+ 1·02	·55	7	17	...	...	...	...	...	...
XXII.		Galway	3·70	...	·66	6	24	54·0	21	32·0	13¶	2	...
XXIII		Waringstown	2·67	...	·60	16	23	56·0	29	27·0	14	5	15
,,		Londonderry	2·59	...	·36	29	22	54·0	4	31·0	15	2	13
,,		Edenfel (Omagh)	2·21	...	·37	29	22	54·0	4	25·0	10**	11	...

* And 18, 20, 28. † And 10, 12, 18, 28, 29. ‡ And 28. § And 24. ‖ And 4, 24.
¶ And 15. ** And 12.

\+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON JANUARY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

SELBORNE.—Bar. very high during the first week. Wind variable, principally from S.W. H on 8th and 12th.

BANBURY.—A great deal of high wind during the month. Floods on 17th and 19th.

CULFORD.—Mean temp. of month 41°·6. Easterly winds prevailed on 11 days. T with H on 20th.

COSSEY.—A genial month, favourable to the growth of the wheat crop, which is backward.

BODMIN.—Mean temp. of month 44°·7. A very genial month, and the large rainfall was most welcome when the droughts of the four previous months had almost dried up the springs.

CIRENCESTER.—Foggy, with S.E. wind, and frost at the beginning of the month, afterwards seasonable weather with more than average rainfall.

SHIFNAL.—A genuine February. R falling on 22 days, but with the exception of one heavy fall, chiefly in small quantities; much fog throughout, with wind persistently S., S.W., and S.E. till 23rd, N. and N.W. on the last 5 days. Winds frequently heavy, and on the 26th violent with H. Snowdrops showing on 5th; aconites showing on 10th; snowdrops full out on 25th.

ORLETON.—Temp. variable, but on the whole rather more than 1° above the average. Fogs were frequent at the beginning of the month, and the sky was generally covered with clouds, but there were a few fine days. The first four days were dry, but afterwards there were only three days without R. Bar. generally low. The wind was very strong on the 7th and 28th, and was frequently rough.

GRIMSBY.—A very seasonable month, many days fine and pleasant. A great contrast to February 1879. T on 18th and 20th. Snowdrops in flower on 18th; violets in flower in sheltered nooks on 20th; rooks building on 23rd; crocus in flower on 26th.

ARDWICK.—On the whole a temperate month, but the weather was broken and unsettled. The wind was rather rough on two or three occasions, but there was little frost.

YORK.—A decided change in the general character of the weather after the first week. The dry period had quite passed. Mock sun on 10th. Very dark on 20th, making gaslight necessary at midday.

WALES.

HAVERFORDWEST.—A wet chilly month, very stormy and wild, but with very little frost, and although R fell frequently there was only one heavy fall. A great barometric depression on the 8th and 9th, with a hard gale lasting nearly 36 hours, lowest reading 28·787 in. (corrected), and another on the 15th and 16th. The night of the 14th was remarkably fine, clear, and frosty, with T at midnight, about 5 a.m. on 15th the wind backed to S.E. and began to blow, increasing to a furious gale, with heavy R, the storm lasted through the night, and blew, if anything, harder on the 16th, lowest bar pressure reached 28·402 in. (corrected) at 1 p.m. on 16th. From the 23rd to 26th the weather was fine and frosty, and from that date to the end of the month wet.

ABERDOVEY.—The rain fell chiefly in the nights, and the days were warm and bright. Prevailing wind westerly.

LLANDUDNO.—On the whole a fine month, and nearly 2° warmer than the average. The rainfall was about ·5 in above the average, but no heavy fall occurred, although for four days consecutively (16th to 19th), the bar. was below 29 inches, neither was there any corresponding force of wind.

SCOTLAND.

CARGEN.—A wet and rather stormy month. Mean temp. 42°·9 about 3° above the average.

HAWICK.—A very mild February; pastures are greener than they were at the beginning of April last year. Lark first heard on 8th.

ARDDAROCH.—The month was generally stormy, with much R and very little sunshine.

KILMORY.—Although the rainfall was large, the greater part having fallen in the night, many observers would have called it a dry month.

BRAEMAR.—A wet, but very mild month.

PORTREE.—A wet, cold, and stormy month. Very strong gales on 17th and 26th, almost equal to that of December 28th, 1879. Frequent S and H showers.

CULLODEN.—The weather during the month was favourable for out-door work; little R and neither S nor fog; frosts generally slight and of short duration. Vegetation advanced in field and garden.

DUNROBIN.—Weather very mild and open.

SANDWICK.—Generally a mild pleasant month till 25th, but during the last 5 days we had either R or storm. On the 26th there was a gale of 62 miles an hour from 3 to 4 a.m., and 50 miles or more from 2 to 7 a.m.; and on 28th a gale of 60 miles or more from 4 to 9 a.m.; and it was even 70 miles from 6 to 7 a.m. There was also a gale of 50 to 60 miles from 8 p.m. on 16th to 2 a.m. on 17th.

IRELAND.

WATERFORD.—Wind very violent on 6th and 13th. Bar. very low on 16th.

KILLALOE.—Fairly average weather for the month, for although R fell on more than the usual number of days, the quantity was not excessive. Heavy gales of wind on 14th and 15th. Mean temp. 43°·2.

WARINGSTOWN.—Bar. at 7 p.m. on 16th, corrected and reduced 28·339 in.

LONDONDERRY.—Prevailing winds S.W. and W.

THIRTY SUMMERS.

To the Editor of the Meteorological Magazine.

SIR,—In the month of May last year Mr. W. Lucas published a table in the magazine giving a record of the temperature of 30 years' winters. It would add very much to the interest taken in the subject if he would now publish the temperature of the correspond-30 years' summers.—Yours truly,

FRED. SLADE.

Southbank Road, Kenilworth, March 11th, 1880.

HAILSTORM NEAR BRISBANE, QUEENSLAND.—It is sometimes doubted by people living in cold climates whether hailstones ever do penetrate through ordinary galvanised iron, as related by travellers. If any such sceptic had been present in Ipswich on the 18th November, 1879, his doubts would soon have been set at rest. Iron roofs were completely riddled by the hail; the School of Arts had every pane of glass broken; the Church of England School was blown down, a large part of the railway station was a complete wreck, and every building, every garden, every vineyard in the place has received damage to a very serious extent.—*The Colonies and India*, January 17th.